Woody Biomass: Utilization, Conservation, or Wildland Fire Consumption

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Whether the weather is cold

or whether is weather is hot

We must weather the weather

whatever the weather

whether we like it or not

unknown

Whether the weather is

cold

or whether is weather is

hot

topography and fuels are

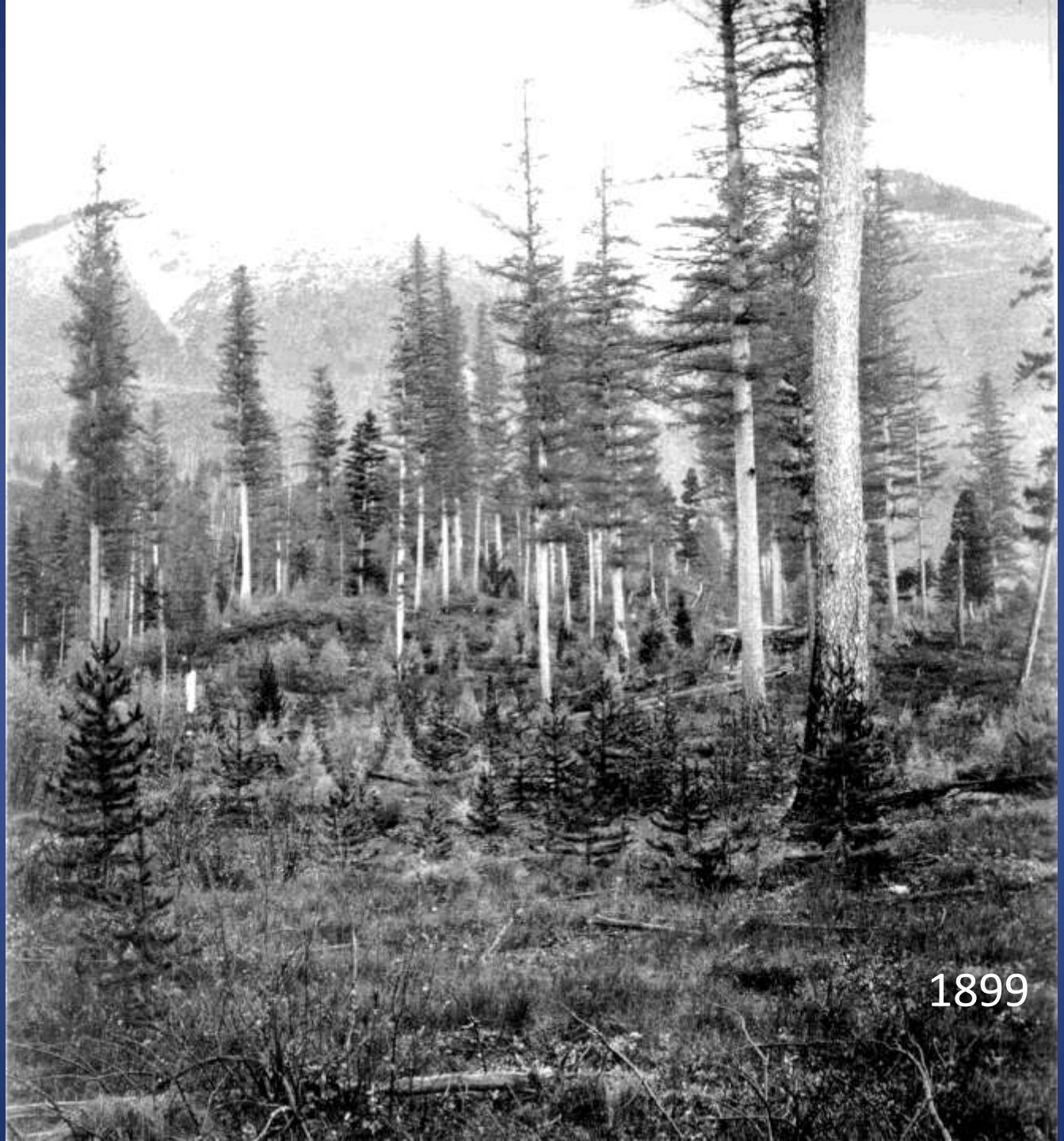
part of the rules

whether we like it or not

J. Agee


1907


2003
1889
1870
1856
1843
1831
1816
1803
1799
1792
1778
1768
1759
1746
1712
1695
1665
1620


1899

Cross-section of a Western larch with 5 fire scars
from Girard Grove at Seeley Lake, MT.
Tree became established in the 1690's


Fine woody debris = fuels that burn in the spreading fire front.


Quantity and quality of fine fuels influence fire intensity, rate of fire spread, and flame lengths

Treatments That Increase Forest Floor Fine Woody Biomass

- Timber Sales – forest products removed
- Species Conversion – subalp. fir in WB Pine
- Reduce Conifer Encroachment – P Pine into bunchgrasses
- Restoration – Aspen stands with spruce-fir intrusion
- Hazardous Fuels Treatment – near high valued resources or communities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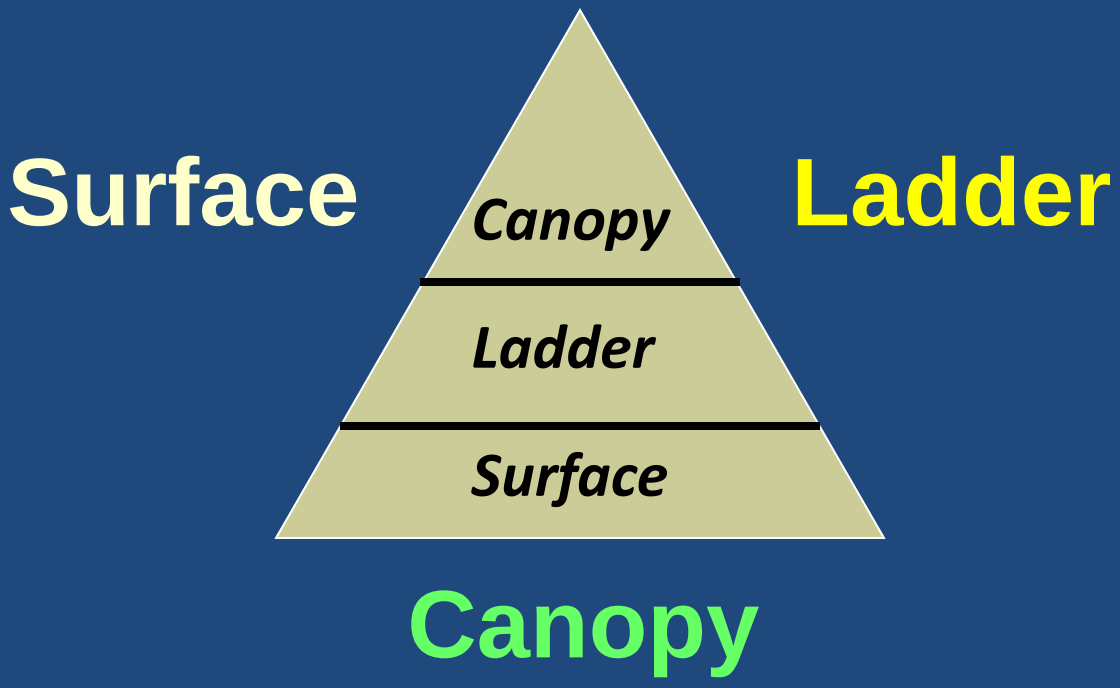
Fuels Treatment Triangle

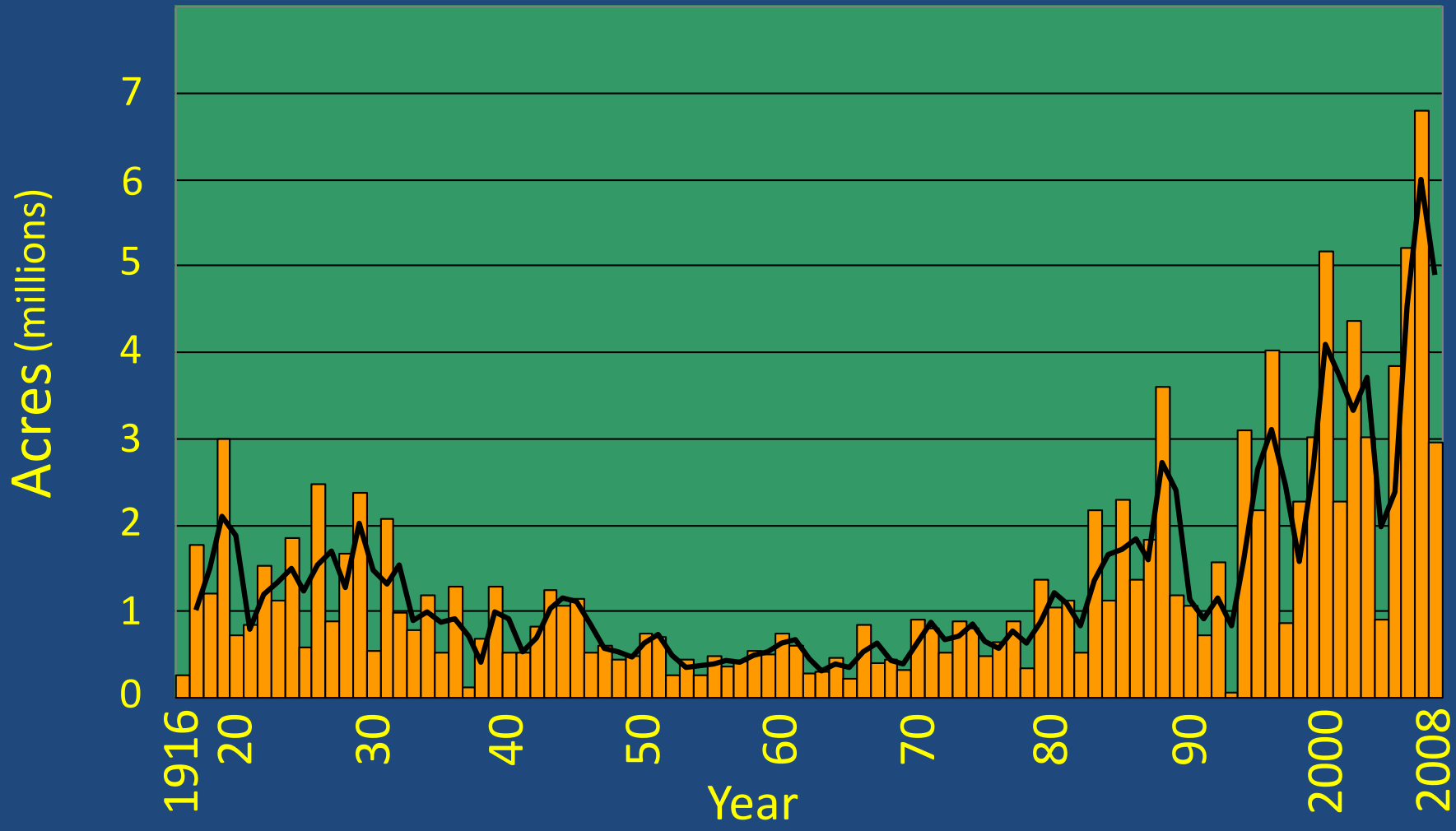
Hierarchal Process



General Biomass Considerations from a Fire Risk Perspective

- High Fire Risk Sites → Biomass highly regarded as a forest fuel; residual biomass in drier, more fire-prone sites will remain a hazard longer due to slower decay rates.
- Low Fire Risk Sites → Biomass less regarded as a forest fuel; residual biomass in mesic sites shows faster hazard reduction due to faster decays rates.

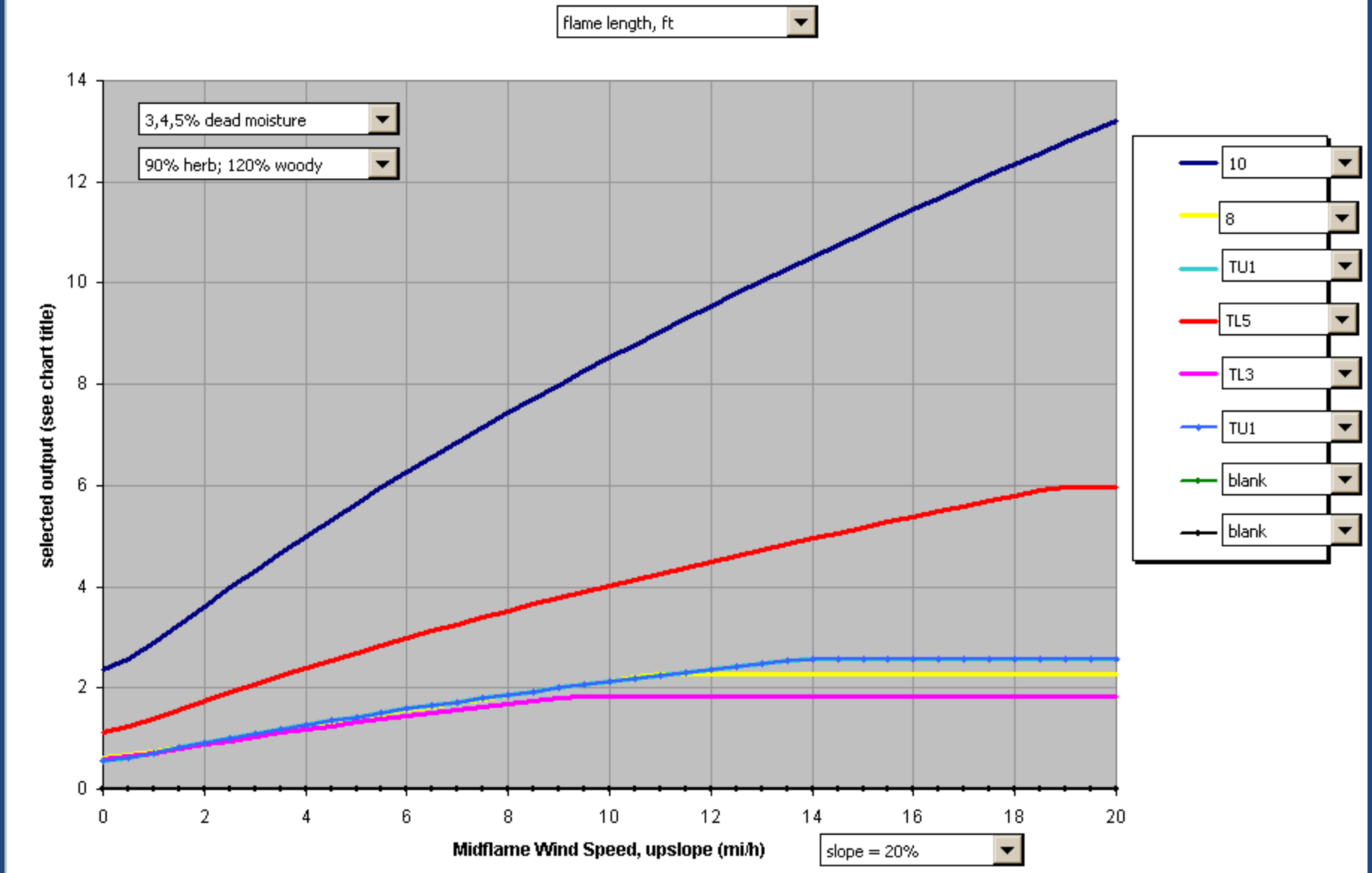
Wildland Fire Acres Burned in the 11 Western States*



*Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming

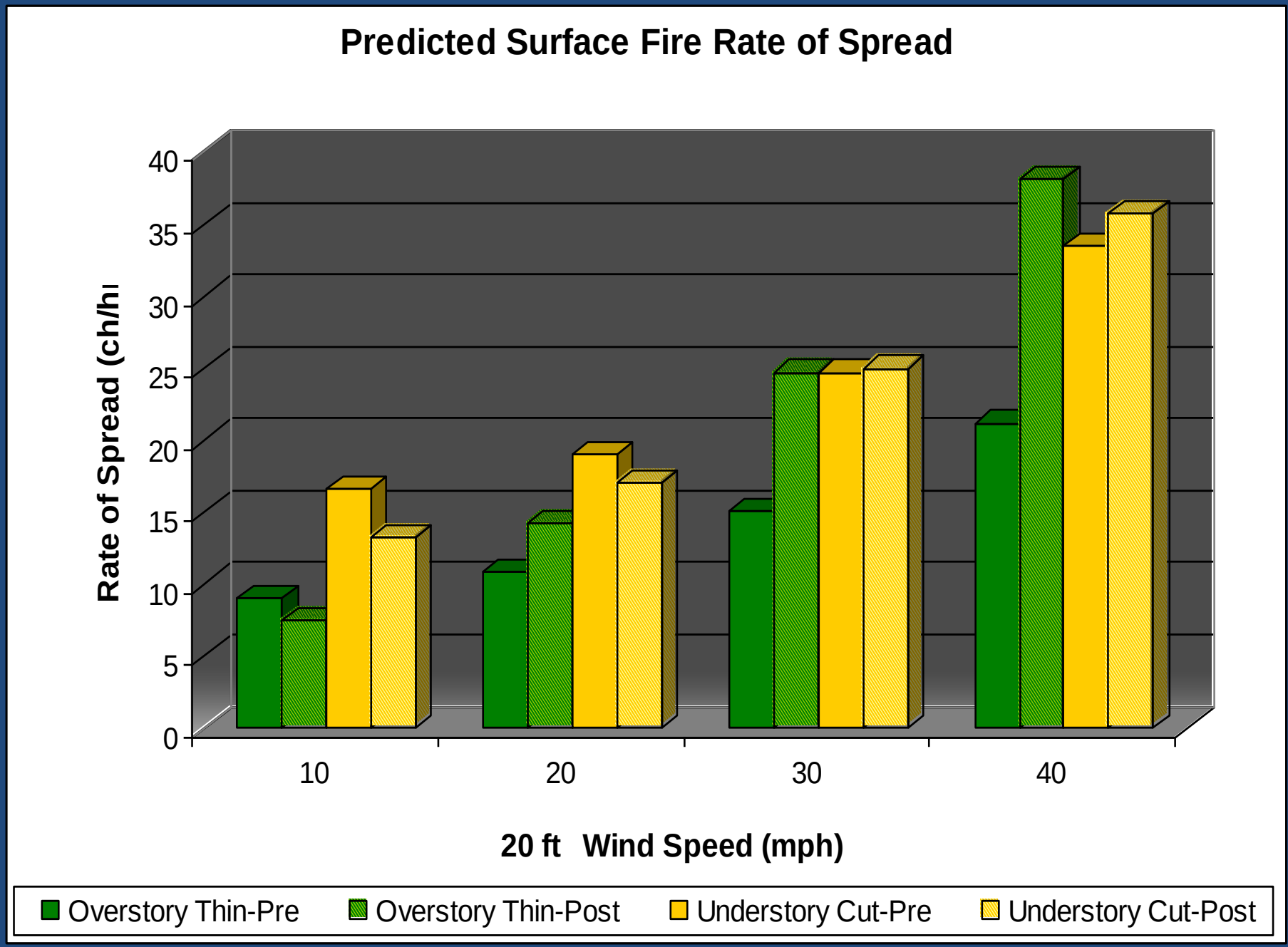
Importance of Biomass (Fuel) Quantity

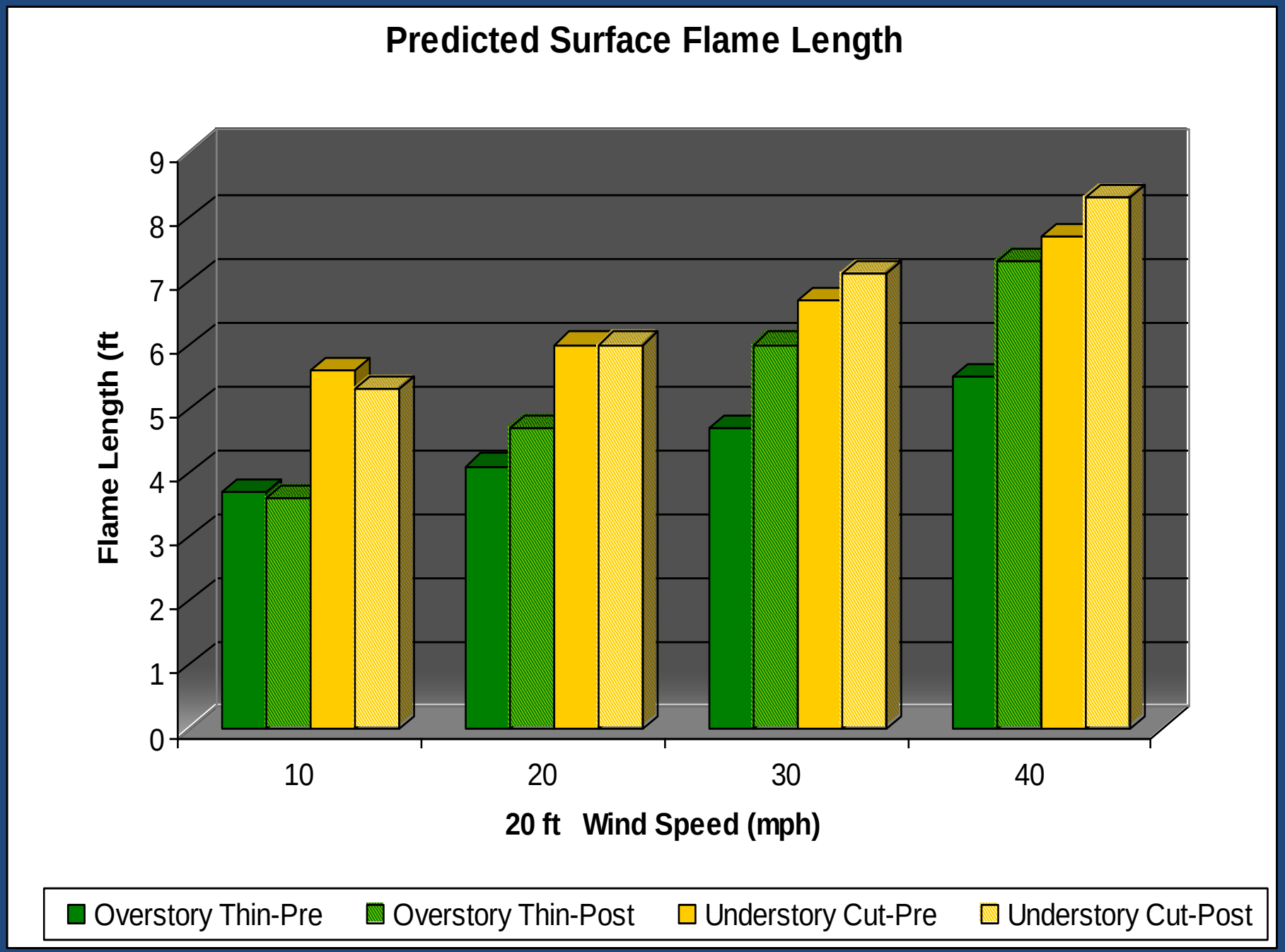
- As the amount of fine woody biomass increases, expected fire intensity increases
- Certain mechanical thinning operations concentrate fine biomass, resulting in highly variable expected fire intensity ranging from very low with little impact to very high with high crown scorch or even passive crown fire


flame length, ft
3,4,5% dead moisture
90% herb; 120% woody
selected output (see chart title)
0
2
4
6
8
10
12
14
0
2
4
6
8
10
12
14
16
18
20
Midflame Wind Speed, upslope (mi/h)
slope = 20%
10
8
TU1
TL5
TL3
TU1
blank
blank

Importance of Biomass (Fuel) Quality

- For a given biomass (fuel) quantity, a higher percent smallest classes = higher fire intensity
- For a given fuel quantity, the less compact the fuelbed, the higher the fire intensity
- An open stand = warmer temps, lower RH's, higher wind speeds than a closed stand; for a given fuel quantity, an open stand = warmer, drier fuels, higher winds, thus higher surface fire intensity compared to a closed stand


Predicted Surface Fire Rate of Spread
Rate of Spread (ch/hr
40
35
30
25
20
15
10
5
0
10
20
30
40
20 ft Wind Speed (mph)
Overstory Thin-Pre
Overstory Thin-Post
Understory Cut-Pre
Understory Cut-Post


Predicted Surface Flame Length
Flame Length (ft
0
1
2
3
4
5
6
7
8
9
10
20
30
40
20 ft Wind Speed (mph)
Overstory Thin-Pre
Overstory Thin-Post
Understory Cut-Pre
Understory Cut-Post


Sheepnose Shelterwood (2001)
Shelterwood Harvest,
fuels crushed
N
Photo: Erik Martinson

Theoretical Biomass Thresholds

<u>High End Threshold</u>: Exceeding this, unacceptable fire behavior and fire effects will likely occur

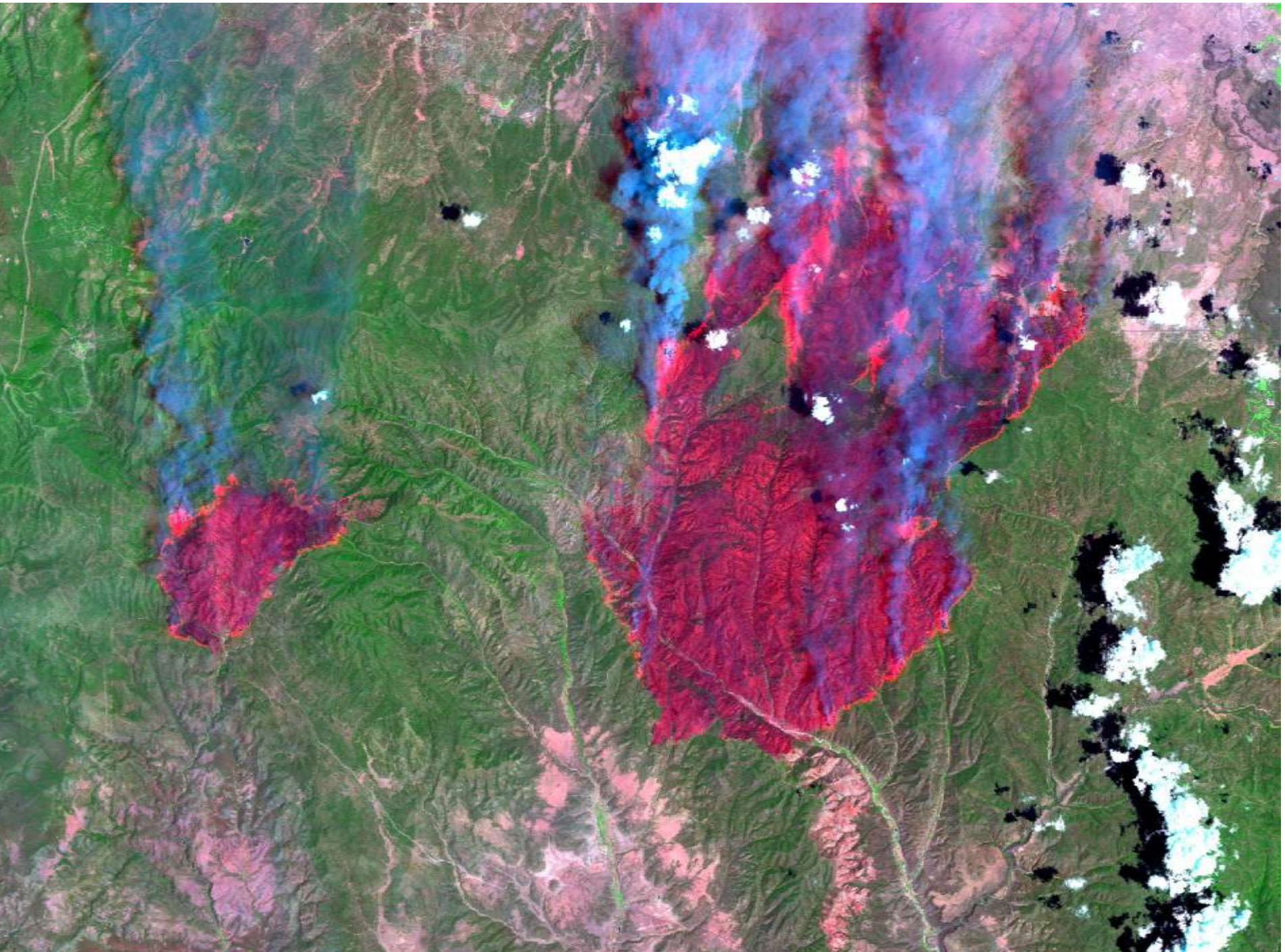
Optimum Range

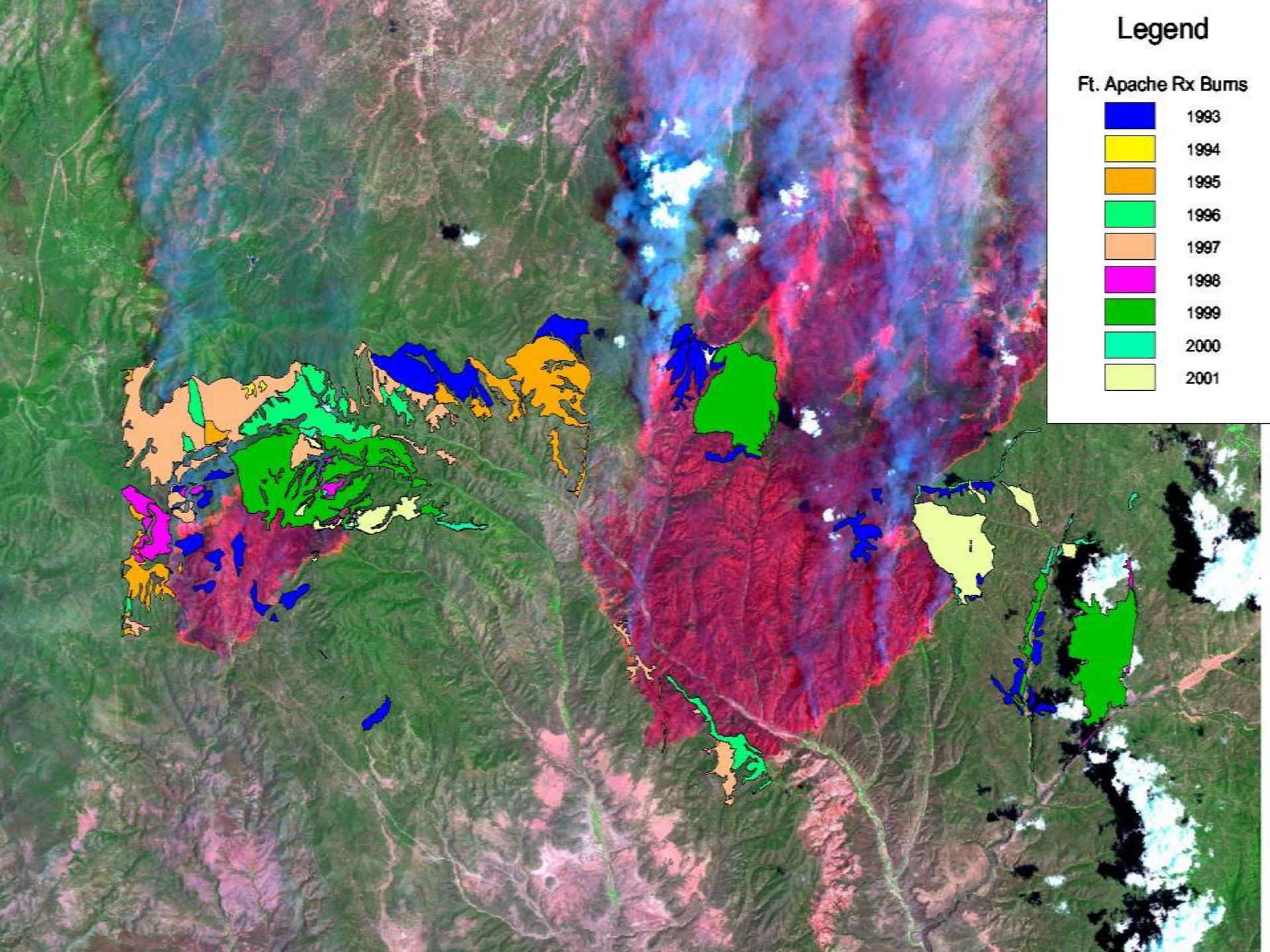
<u>Low End Threshold</u>: Below this, degraded wildlife habitat and/or site productivity will likely occur

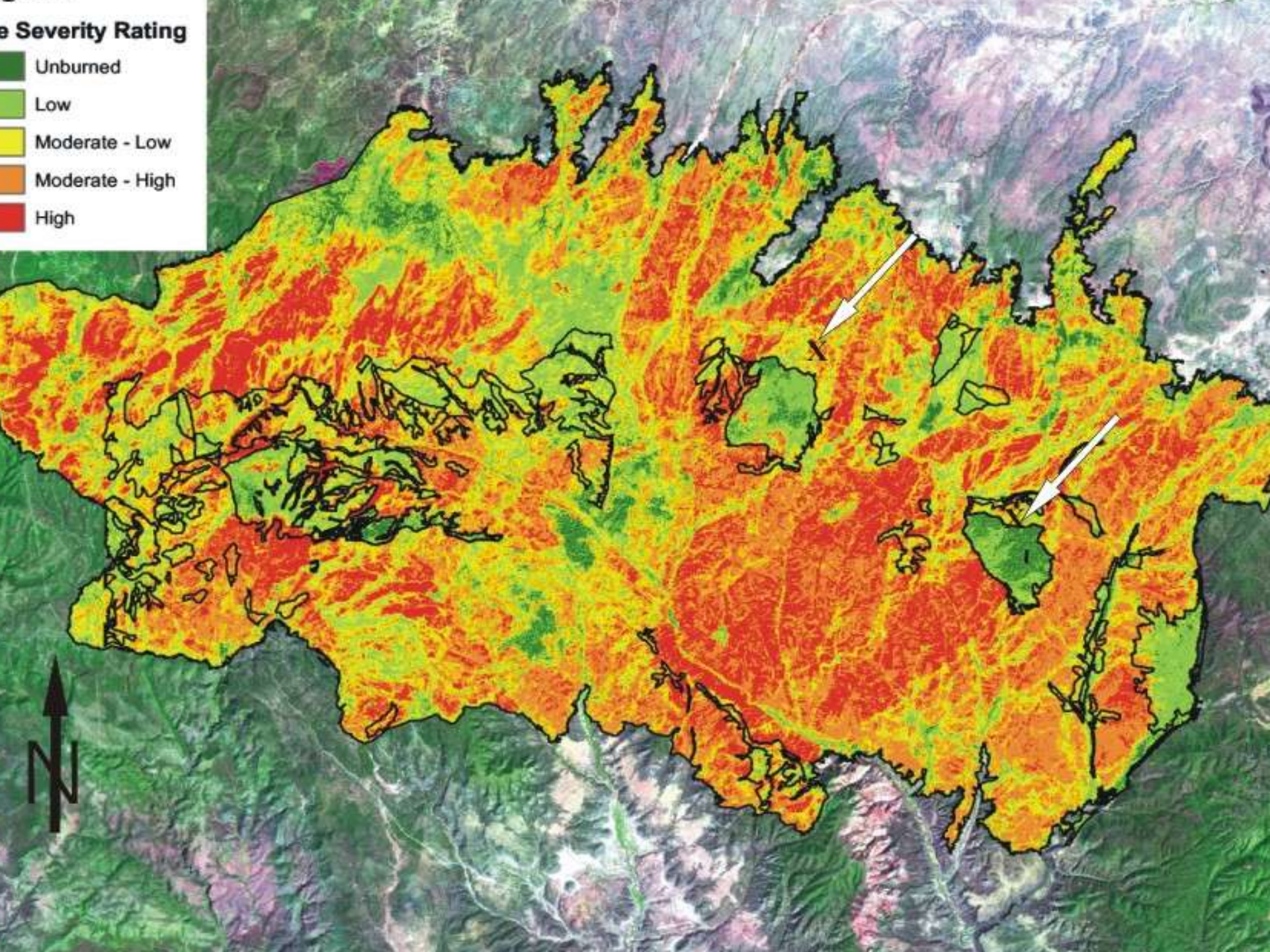
Summary

- Since fine woody debris = highly flammable surface fuels, consider biomass management as disturbance (fire) management.
- With all other conditions being equal, larger amounts of fine woody debris = greater fire intensity and greater above ground fire effects
- With equal amounts of woody debris, open stands result in higher surface fire behavior than closed stands
- Immediate post-treatment biomass conditions will change, slowly or rapidly, with time with continuous inputs and turnover


Questions?




Legend
Ft. Apache Rx Burns
1993
1994
1995
1996
1997
1998
1999
2000
2001


e Severity Rating
Unburned
Low
Moderate - Low
Moderate - High
High
N